4.1 Triangle Sum Conjecture

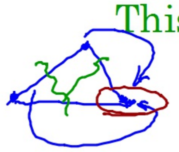
8/25/16

I will be able to discover and explain the sum of the measures of a triangle, develop inductive and deductive reasoning, and practice using geometry tools.

4.1 Triangle Sum Conjecture

8/25/16

This is a partner activity.



Each group needs:
1 protractor
1 yellow half-sheet of paper
1 writing instrument
1 pair of scissors

- Draw three different triangles on one side of the paper.
- Each partner carefully measures the three angles of each triangle and finds the sum of the angles of each triangle.
- Compare your sums with your partner. If they are not the same, come up with some reasons why they might differ.
- Carefully cut out the triangles and label the three corners of each.
- Carefully tear one of the three triangles into three sections each so that one corner from the triangle is on each piece.
- Arrange the pieces of one triangle so that the vertices meet.
- Continue with the other two triangles.
- Propose a conjecture for your results.

In mathematics, a **conjecture** is a mathematical statement which appears to be true, but has not been formally proven. A **conjecture** can be thought of as the mathematicians way of saying “I believe that this is true, but I have no proof yet”. A **conjecture** is a good guess or an idea about a pattern.

4.1 Triangle Sum Conjecture

8/26/16

$\overleftrightarrow{EC}$ and $\overline{AB}$ are ∥ (given).

prove $m\angle 2 + m\angle 4 + m\angle 5 = 180°$

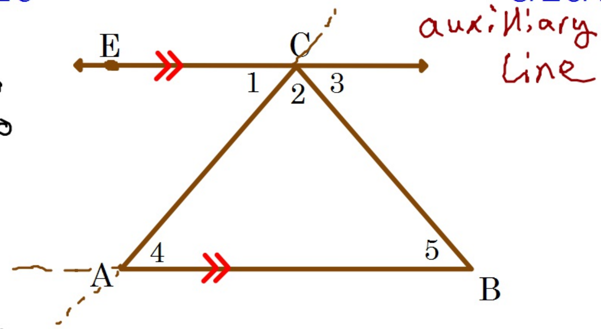
since $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

and $m\angle 4 = m\angle 1$ because alternate interior ∠s of ∥ lines are congruent

$m\angle 5 = m\angle 3$ same reason

$\therefore m\angle 4 + m\angle 2 + m\angle 5 = 180°$

The interior angles of a triangle sum to 180°.

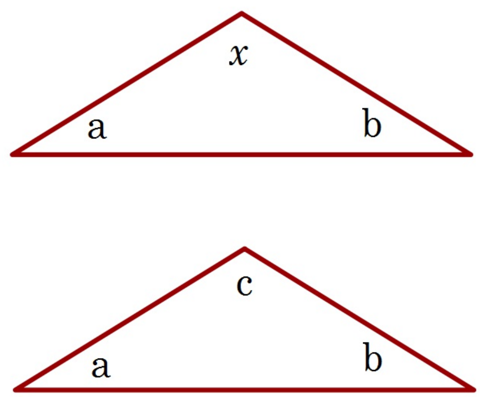


I will be able to discover and explain the sum of the measures of a triangle, develop inductive and deductive reasoning, and practice using geometry tools.

4.1 Triangle Sum Conjecture

Third Angle Conjecture

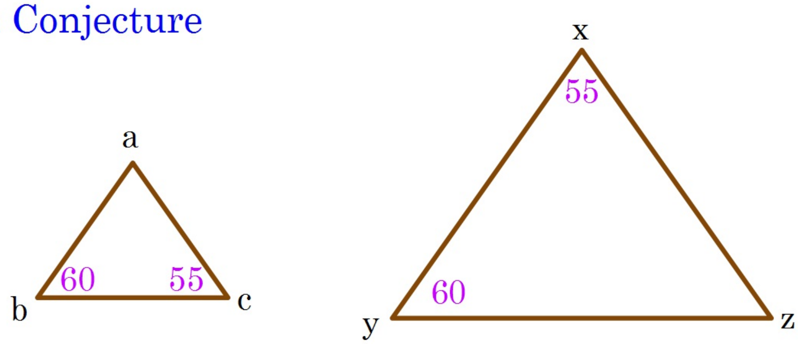
If two corresponding angles in two similar triangles are congruent, the third angle must be congruent also.



I will be able to discover and explain the sum of the measures of a triangle, develop inductive and deductive reasoning, and practice using geometry tools.

4.1 Triangle Sum Conjecture

If $\angle b \cong \angle y$
and $\angle c \cong \angle x$
then $\angle a \cong \angle z$



I will be able to discover and explain the sum of the measures of a triangle, develop inductive and deductive reasoning, and practice using geometry tools.

4.1 Triangle Sum Conjecture

Exercises pp. 200-201 DG #1-22 Evens
With a partner

I will be able to discover and explain the sum of the measures of a triangle, develop inductive and deductive reasoning, and practice using geometry tools.

Polygon Sum Conjecture 8/29/16

IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

Polygon Sum Conjecture 8/29/16

Polygon a many sided closed shape

Each partnership will draw several examples of their polygon. They will then measure the interior angles of their polygon and sum the measures. The partnership will come up with a conjecture for their particular polygon.

- ✓ Quadrilateral
- ✓ Pentagon
- ✓ Hexagon
- ○ Heptagon
- ✓ Octagon
- ○ Nonagon
- ○ Decagon
- ○ Hendecagon
- ○ Dodecagon

The sum of the # angles of any name is #°.

IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

Polygon Sum Conjecture

The sum of the ____ angles of any __________ is _____.

- Quadrilateral – the sum of the 4 angles of any quadrilateral is 360°
- Pentagon 5, pentagon, 540°

n-sides

- Hexagon 6, hexagon, 720° (n-2)180 interior angles
- Heptagon 7, heptagon, 900°
- Octagon the sum of the 8 angles of any octagon is 1080°
- Nonagon 9, nonagon, 1260° 7×180
- Decagon 10, decagon, 1440° 8×180
- Hendecagon 11, hendecagon, 1620° 9×180
- Dodecagon 12, dodecagon, 1800° 10×180

IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

Polygon Sum Conjecture

Polygon sum conjecture

The sum of the n interior angles of an n-gon is 180(n-2).

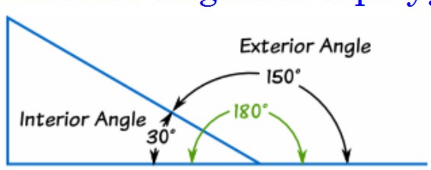
Exercises DG pp. 257-8 #1, 2, 5, 6, 8-11

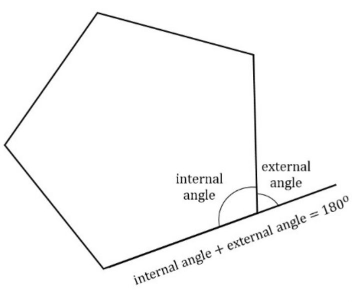
IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

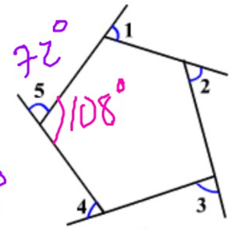
Exterior angles of a polygon 8/31/16

IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon 8/31/16

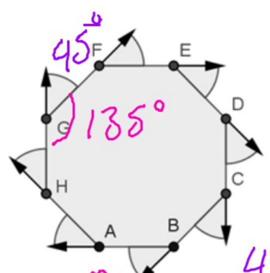






72°
x 5
360°

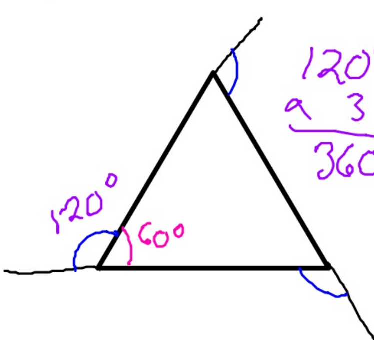
penta



Octa

45°
x 8
360°

Can we get a single answer for
"For any polygon, the sum of the exterior angles is 360°."?



120°
x 3
360°

IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon

How can we use this to find the interior angle measurements?

$$180 - \frac{360}{n} = \text{interior } \angle \text{ measurement}$$

$$180 - \frac{360}{100} = 176.4°$$

Can we write a conjecture for an equiangular (regular) polygon?

you can find the measure of the interior angle of any n-gon using the formula

$180 - \frac{360}{n}$ or $\frac{180(n-2)}{n}$

IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon

Exercises DG p. 262 #1, 4-12 all

IWBAT discover the sum of the measures of the exterior angles of a polygon.

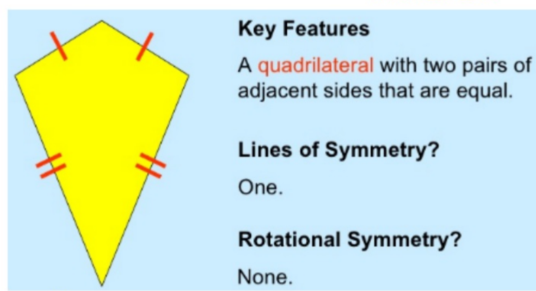
Kites and Trapeziod Properties 9/02/16

IWBAT discover properties of kites and trapezoids.

Kites and Trapeziod Properties 9/02/16

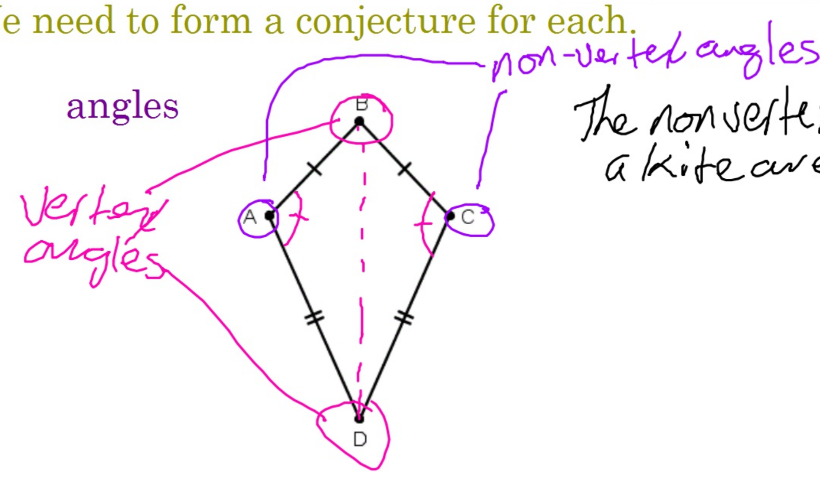
What can we say about kite

- angles
- diagonals
- diagonal bisectors
- angle bisectors?



We need to form a conjecture for each.

angles

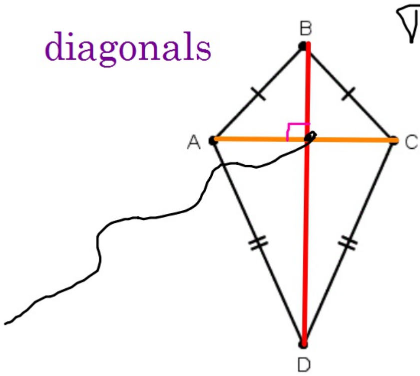


The nonvertex angles of a kite are congruent.

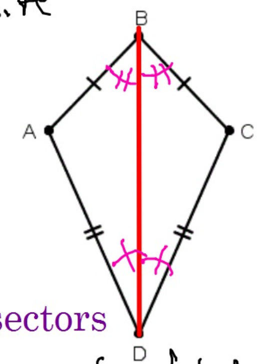
IWBAT discover properties of kites and trapezoids.

Kites and Trapeziod Properties

diagonals



The diagonals of a kite intersect perpendicularly.

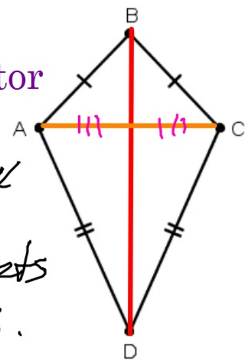


angle bisectors

the diagonal which connects the vertex angles bisects the vertex angles.

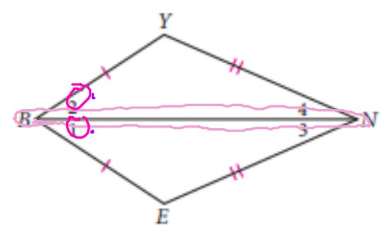
diagonal bisector

The diagonal that connects the vertex angles bisects the diagonal that connects the nonvertex angles.



IWBAT discover properties of kites and trapezoids.

Copy and complete the flowchart to show how the Kite Angle Bisector Conjecture follows logically from one of the triangle congruence conjectures.



Given: Kite *BENY* with $\overline{BE} \cong \overline{BY}$, $\overline{EN} \cong \overline{YN}$

Show: $\overline{BN}$ bisects $\angle B$
$\overline{BN}$ bisects $\angle N$

$\overline{BN}$ bisects $\angle B$ + $\overline{BN}$ bisects $\angle N$

Flowchart Proof

1. $\overline{BE} \cong \overline{BY}$ — Given
2. $\overline{EN} \cong \overline{YN}$ — Given
3. $\underline{?} \cong \underline{?}$ — Same segment
4. $\triangle BEN \cong \underline{?}$ — $\underline{?}$ Congruence shortcut
5. $\angle 1 \cong \underline{?}$ and $\angle 3 \cong \underline{?}$ — $\underline{?}$
6. $\underline{?}$ and $\underline{?}$ — Definition of angle bisector

3) $\overline{BN} \cong \overline{NB}$

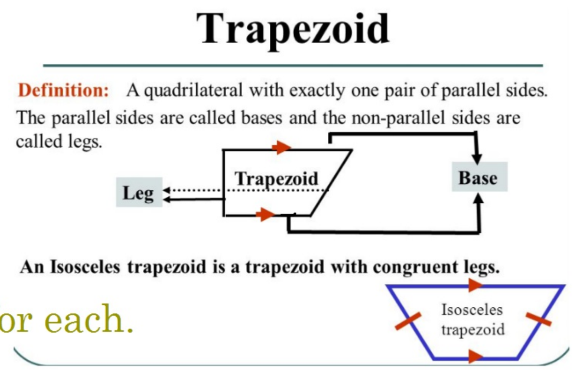
$\triangle BEN \cong \triangle BYN$
Triangle C.S.
(SSS)

$\angle 1 \cong \angle 2$
$\angle 3 \cong \angle 4$
CPCTC

Kites and Trapeziod Properties

What can we say about trapezoid

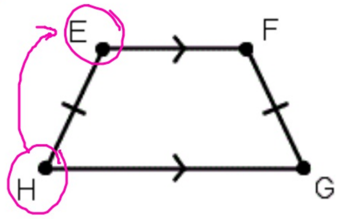
- consecutive angles
- Isosceles trapezoids
- Isosceles trap diagonals?

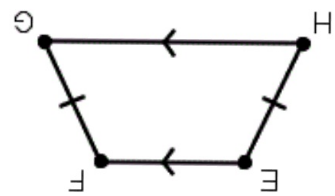


We need to form a conjecture for each.

consecutive angles

Consecutive angles of a trapezoid are supplementary



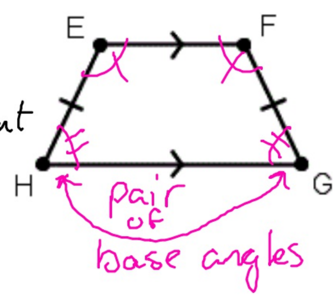


IWBAT discover properties of kites and trapezoids.

Kites and Trapeziod Properties

isosceles trapezoid

both pairs of base angles are congruent

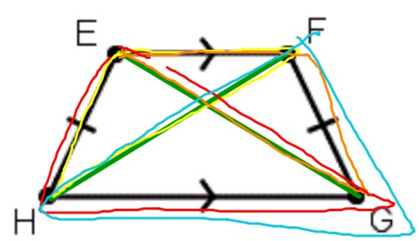


isosceles trapeziod

the diagonals are congruent

$\Delta EHF \cong \Delta EFG$

$\Delta GHE \cong \Delta HGF$



IWBAT discover properties of kites and trapezoids.

Kites and Trapeziod Properties

Exercises DG pp. 269-270 #1, 2, 4, 6, 9

IWBAT discover properties of kites and trapezoids.

Kites and Trapeziod Properties 9/07/16

Exercise #15 DG p. 271 on your own,
on a separate paper to be turned in.

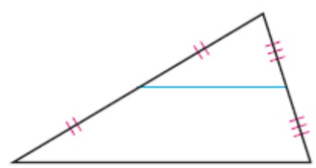
IWBAT discover properties of kites and trapezoids.

Properties of Midsegments 9/08/16

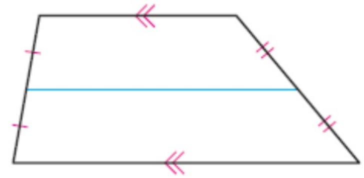
IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

The segment connecting the midpoints of two sides of a triangle is the midsegment of a triangle.

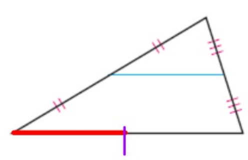


The segment connecting the midpoints of the two nonparallel sides of a trapezoid is also called the midsegment of a trapezoid.



Triangle Midsegment Conjecture

A midsegment of a triangle is __$\parallel$__ to the third side and __half__ the length of __the third side__.

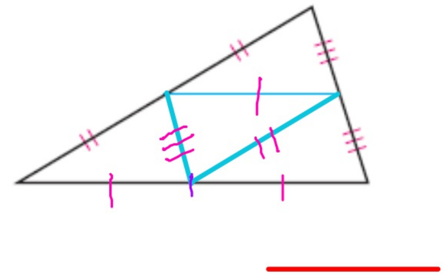


IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Three Midsegment Conjecture

The three midsegments of a triangle divide it into four congruent triangles.

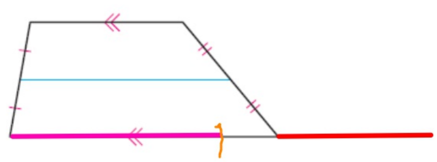


IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Trapezoid Midsegment Conjecture

The midsegment of a trapezoid is $\parallel$ to the bases and is equal in length to half of the sum of the bases.



IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Exercises DG pp. 275-276 #2-4, 6, 7, 8

IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Parallelograms

9/09/16

IWBAT discover properties of parallelograms.

Properties of Parallelograms

9/09/16

A parallelogram is a quadrilateral whose opposite sides are parallel.

- Using the lines on a piece of graph paper as a guide, draw a pair of parallel lines that are at least 6 cm apart.
- Using the parallel edges of your straightedge, make a parallelogram. Label your parallelogram LOVE.
- Look at the opposite angles. Measure the angles of parallelogram LOVE.
- Compare a pair of opposite angles using your protractor.
- Compare results with your table mates.

Parallelogram Opposite Angles Conjecture

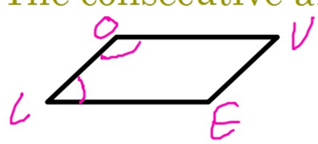
The opposite angles of a parallelogram are congruent.

IWBAT discover properties of parallelograms.

Properties of Parallelograms

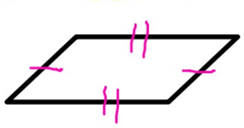
Parallelogram Consecutive Angles Conjecture

The consecutive angles of a parallelogram are supplementary.



Parallelogram Opposite Sides Conjecture

The opposite sides of a parallelogram are congruent.

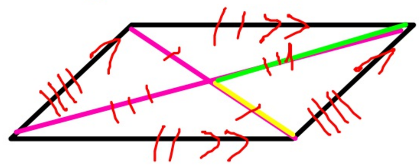


IWBAT discover properties of parallelograms.

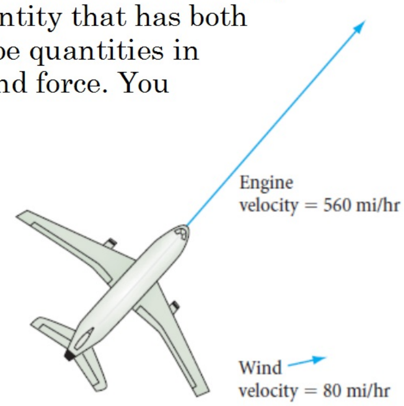
Properties of Parallelograms

Parallelogram Diagonals Conjecture

The diagonals of a parallelogram bisect each other



Parallelograms are used in vector diagrams, which have many applications in science. A vector is a quantity that has both magnitude and direction. Vectors describe quantities in physics, such as velocity, acceleration, and force. You can represent a vector by drawing an arrow. The length and direction of the arrow represent the magnitude and direction of the vector. For example, a velocity vector tells you an airplane's speed and direction. The lengths of vectors in a diagram are proportional to the quantities they represent.



IWBAT discover properties of parallelograms.

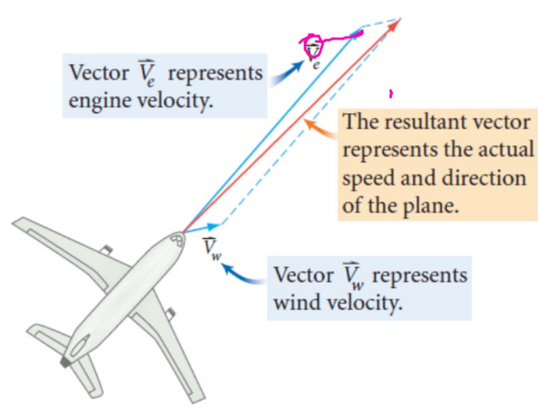
Properties of Parallelograms

In many physics problems, you combine vector quantities acting on the same object. For example, the wind current and engine thrust vectors determine the velocity of an airplane. The resultant vector of these vectors is a single vector that has the same effect. It can also be called a vector sum.

To find a resultant vector, make a parallelogram with the vectors as sides. The resultant vector is the diagonal of the parallelogram from the two vectors' tails to the opposite vertex.

In the diagram at right, the resultant vector shows that the wind will speed up the plane, and will also blow it slightly off course.

What would the pilot of this plane have to do to stay on course?



IWBAT discover properties of parallelograms.

Properties of Parallelograms

Exercises DG p. 281 #3-6, 11, 13

IWBAT discover properties of parallelograms.

Properties of Special Parallelograms

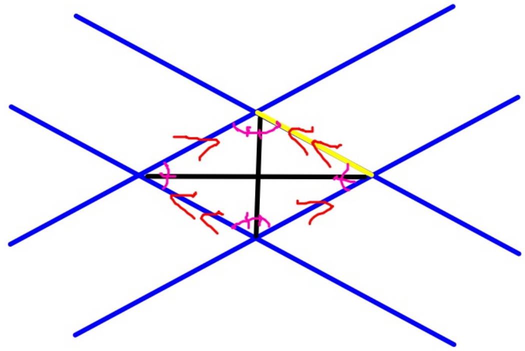
9/12/16

IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms 9/12/16

Double-Edged Straightedge Conjecture

If two parallel lines are intersected by a second pair of parallel lines that are the same distance apart as the first pair, then the parallelogram formed is a rhombus?

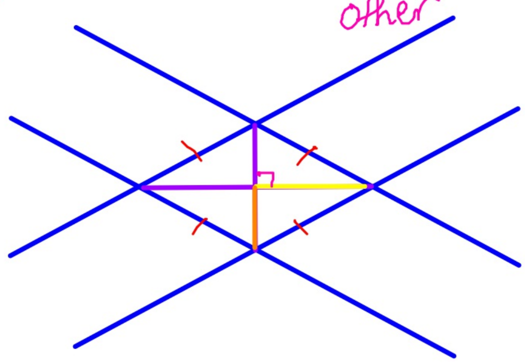


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rhombus Diagonals Conjecture

The diagonals of a rhombus are perpendicular, and they bisect each other.

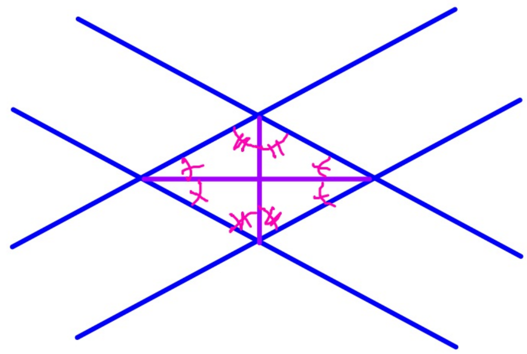


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rhombus Angles Conjecture

The diagonals of a rhombus bisect the angles of the rhombus.

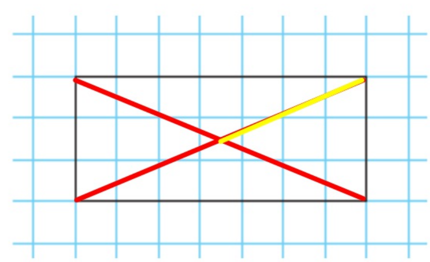


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rectangle Diagonals Conjecture

The diagonals of a rectangle are congruent and bisect each other

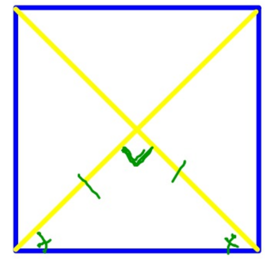


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Square Diagonals Conjecture

The diagonals of a square are congruent, perpendicular, and bisect each other



IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Exercises DG pp. 290-291 #2-18 evens, 20, 21

IWBAT discover properties of rhombuses, rectangles, and squares.

Proving Quadrilateral Properties 9/16/16

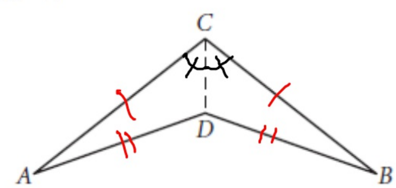
IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties 9/16/16

A concave kite is sometimes called a dart.

Given: Dart $ADBC$ with $\overline{AC} \cong \overline{BC}$, $\overline{AD} \cong \overline{BD}$

Show: $\overline{CD}$ bisects $\angle ACB$



$\overline{AC} \cong \overline{BC}$ — Given

$\overline{AD} \cong \overline{BD}$ — Given

$\overline{CD} \cong \overline{DC}$ — Same segment

$\Rightarrow$ $\triangle ACD \cong \triangle BCD$ — SSS

$\Rightarrow$ $\angle ACD \cong \angle BCD$ — CPCTC

$\Rightarrow$ $\overline{CD}$ bisects $\angle ACB$ — Definition of an angle bisector

IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

Paragraph proof

"It is given that $\overline{AC} \cong \overline{BC}$ and $\overline{AD} \cong \overline{BD}$. $\overline{CD} \cong \overline{CD}$ because it is the same segment in both triangles. So, $\triangle ADC \cong \triangle BDC$ by the SSS Congruence Conjecture. So, $\angle ACD \cong \angle BCD$ by the definition of congruent triangles (CPCTC). Therefore, by the definition of angle bisectors, $\overline{CD}$ is the bisector of $\angle ACB$. Q.E.D."

The abbreviation Q.E.D. at the end of a proof stands for the Latin phrase *quod erat demonstrandum*, meaning "which was to be demonstrated."

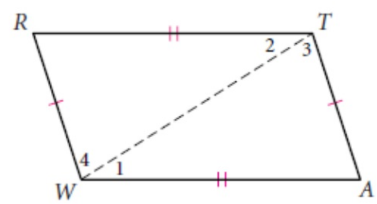
IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

Prove the conjecture: If the opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Given: Quadrilateral $WATR$, with $\overline{WA} \cong \overline{RT}$ and $\overline{WR} \cong \overline{AT}$, and diagonal $\overline{WT}$

Show: $WATR$ is a parallelogram



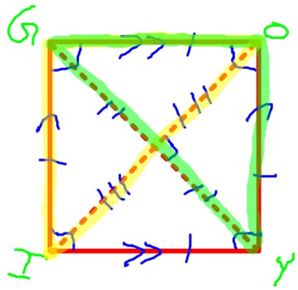
Flowchart Proof

1. $\overline{WA} \cong \overline{RT}$ — Given
2. $\overline{WR} \cong \overline{AT}$ — Given
3. $\overline{WT} \cong \overline{WT}$ — Same seg.
4. $\triangle WRT \cong \triangle TAW$ — SSS
5. $\angle 1 \cong \angle 2$ — CPCTC
6. $\overline{RT} \parallel \overline{WA}$ — AIA
7. $\angle 4 \cong \angle 3$ — CPCTC
8. $\overline{RW} \parallel \overline{TA}$ — AIA
9. $WATR$ is a parallelogram — Def of parallelogram

IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

Exercises p. 297 #7 & 9



$\overline{OY} \cong \overline{GI}$
Def. of a □

$\overline{GO} \cong \overline{GO}$
Same Segment

$\angle O \cong \angle G$
Def. of a □

$\triangle GOY \cong \triangle OGI$
SAS

$\Rightarrow$ $\overline{GY} \cong \overline{IO}$
CPCTC

IWBAT practice writing flowchart and paragraph proofs.

Unit test review

pp. 300-304 #14, 15, 21-24, 25, 27

What should be in your notebook as of today:

Exercises pp. 200-201 DG #1-22 Evens

Exercises DG pp. 257-8 #1, 2, 5, 6, 8-11

Exercises DG p. 262 #1, 4-12 all

Exercises DG pp. 269-270 #1, 2, 4, 6, 9

Exercises DG pp. 275-276 #2-4, 6, 7, 8

Exercises DG p. 281 #3-6, 11, 13

Exercises DG pp. 290-291 #2-18 evens, 20, 21